UC-NRLF
B 3 071 614

GIFT OF
U. S. govt.

SIGILLVM · VNIVERSITATIS · CALIFORNIENSIS
LVX
FIAT
MDCCCLXVIII

EX LIBRIS

~~Mann Lib.~~
Agric. Dept.

Digitized by the Internet Archive
in 2007 with funding from
Microsoft Corporation

http://www.archive.org/details/unistatessandynorf00bonsrich

NOV 22 1911
GIFT

Issued October 21, 1911.

U. S. DEPARTMENT OF AGRICULTURE,

BUREAU OF SOILS—CIRCULAR No. 46.

MILTON WHITNEY, Chief of Bureau.

SOILS OF THE EASTERN UNITED STATES AND THEIR USE—XXIII.

THE ORANGEBURG FINE SANDY LOAM.

BY

JAY A. BONSTEEL,

Scientist in Soil Survey.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1911.

BUREAU OF SOILS.

MILTON WHITNEY, *Chief of Bureau.*

ALBERT G. RICE, *Chief Clerk.*

SCIENTIFIC STAFF.

FRANK K. CAMERON, in charge of Physical and Chemical Investigations.
CURTIS F. MARBUT, in charge of Soil Survey.
OSWALD SCHREINER, in charge of Fertility Investigations.

SOILS OF THE EASTERN UNITED STATES AND THEIR USE—XXIII.

THE ORANGEBURG FINE SANDY LOAM.

GEOGRAPHICAL DISTRIBUTION.

The Orangeburg fine sandy loam, in common with the other members of the Orangeburg series, is found within the Atlantic and Gulf Coastal Plains from southeastern North Carolina to west-central Texas. By far the greater area of this soil occurs in two separate belts in the east Gulf coast region and in one extensive region west of the Mississippi River. The first of the eastern regions marked by the widespread distribution of this type lies in northern Florida, southern Georgia, southern Alabama, and adjacent portions of Mississippi around Mobile Bay. Within this territory the type is not one of the dominant soils, being exceeded in area by members of the Norfolk and other series, although aggregating many thousands of acres in extent. The second of the eastern belts extends from south-central Georgia westward through central Alabama into northeastern Mississippi. Within this region the Orangeburg fine sandy loam and other members of the same series are widely distributed and in many of the soil survey areas constitute the dominant soil types.

West of the Mississippi River there is a large area within which the Orangeburg fine sandy loam and members of the series occupy important rank in point of area and agricultural value. This region comprises the northern and northwestern portion of Louisiana, southwestern Arkansas, the extreme northeastern portion of Texas, and a broad belt extending from the vicinity of Shreveport, La., southwest to the vicinity of San Antonio, Tex. In this timbered region, which separates extensive prairie areas, the members of the Orangeburg series are important soils and the Orangeburg fine sandy loam is the most important, both in extent and in agricultural value.

The Orangeburg fine sandy loam is preeminently a Gulf region soil type with only scattered occurrences along the Atlantic coast. It has been encountered in 50 different soil survey areas located in 10 States, and has been mapped to the extent of 2,507,840 acres. Since only about one-seventh of the total area of the Coastal Plain

region has been covered by surveys, it is probable that the completion of the work will show from 15,000,000 to 17,000,000 acres of this single soil type within the Coastal Plain soil province. In this connection it may be said that more than three-fourths of the entire area of the Orangeburg fine sandy loam included in the completed soil surveys lies in the four States of Alabama, Mississippi, Louisiana, and Texas.

CHARACTERISTICS OF SOIL AND SUBSOIL.

The surface soil of the Orangeburg fine sandy loam to an average depth of 10 or 12 inches is a gray or brown fine sandy loam. This grades downward into a deep red sandy clay which extends to a total depth of 3 feet or more and in turn may be underlain at still greater depths by a stiff red clay. There usually is no well-defined boundary between the fine sandy loam surface soil and the mortarlike sandy clay subsoil. The latter frequently contains quite a proportion of medium to coarse sand, which renders it somewhat friable when partly dry. Wherever drainage is excessive, or where intertilled crops have been grown for a long period of years without proper attention to the restoration of organic matter, the surface soil has a light gray color. In soils newly cleared, or upon fields where the organic matter content has been maintained, the surface soil is darker and usually of some tinge of brown or even chocolate.

The Orangeburg fine sandy loam and its associated soils of the Orangeburg series are easily distinguished from the soils of the Norfolk series, which are characterized by gray surface soils and yellow subsoils, or from the soils of the Portsmouth series, which have a dark-brown or black surface soil and gray or mottled subsoil. The distinctive deep red coloring of the subsoils of the Orangeburg series might be confused with that of the Greenville series but for the fact that the surface soils of this latter group are distinctly red as contrasted with the gray or brown of the Orangeburg. The coloration of the soils of the Guin series is light orange or pale red as distinguished from the deep red of the Orangeburg series. The Orangeburg fine sandy loam may be distinguished from the Susquehanna fine sandy loam through the fact that the subsoil of the latter type is a stiff plastic red or orange clay, nearly always mottled at greater depths.

SURFACE FEATURES AND DRAINAGE.

The general surface features of the Orangeburg fine sandy loam are closely similar in all of the many areas where it has been encountered. There are minor variations, however, which have an important bearing, not so much upon the crop adaptations of the soil type as upon the possibility of its use for any agricultural pur-

pose. The surface of the type is generally rolling to somewhat hilly, with level areas broken by low, rounded ridges, or bounded by sharp hill slopes, often badly eroded. In the southern belt of the Gulf regions where this type is prevalent there are few high hills or steep slopes and the surface configuration is undulating to rolling. It occupies the higher elevations and is surrounded most frequently by soil types of other series, particularly the Norfolk.

In the more inland localities in the eastern Gulf region the type is found at still higher altitudes and is rolling to hilly. A considerable proportion of the area of the type thus far mapped in central Alabama and northeastern Mississippi may be characterized as hilly to rough and broken with erosion as a marked feature on some portions of each area. The Louisiana-Texas region is one of rolling to hilly topography with numerous steep slopes, and a considerable proportion of the area of the Orangeburg fine sandy loam is either threatened by erosion or actually eroded in all of its marginal positions.

The belt immediately along the eastern Gulf coast which is occupied by the Orangeburg fine sandy loam rises to altitudes of 80 to 150 feet and constitutes the higher land of this section. The central area where the Orangeburg fine sandy loam is strongly developed rises from 200 to 500 feet above sea level and is deeply dissected by the larger south-flowing streams of Alabama and Mississippi. In the Louisiana-Texas region the Orangeburg fine sandy loam is found at elevations ranging from 100 or 125 feet to 350 feet and occasionally 500 feet along the western margin of the region in northern Texas and southern Oklahoma.

The Orangeburg fine sandy loam is universally well drained, and there are practically no swampy areas of any extent within the regions of its occurrence. Its elevated position gives rise to rapid gradients in the stream channels and to sharp slopes from the uplands down to the drainage levels. Erosion is everywhere active, particularly along the borders of the type and is one of the greatest menaces to agriculture.

LIMITATIONS IN USE.

The soft friable surface soil of the Orangeburg fine sandy loam is competent to absorb a large amount of moisture and to store it for crop uses. The sandy clay subsoil also prevents excessive percolation of soil moisture, making the type well suited to general farm crops as distinguished from the market-garden or truck crops which are best grown upon less retentive soils. For this reason it is considered one of the best general farming soils of the Gulf Coastal Plain and well adapted to upland cotton, corn, winter oats, cowpeas, and certain other staple crops.

In fields which have been long tilled the surface soil usually lacks organic matter. The remedy for this condition lies with each individual farmer. Improvement with respect to the humus content may be secured within short periods of time through the use of proper methods for the restoration of organic matter to the soil.

The drainage of the type is excellent and only in a few cases excessive. In consequence, little attention need be paid to the construction of open ditches or to ridding the soil of excess moisture in the majority of the areas where it is found. Erosion constitutes one of the most serious dangers with which the farmers upon this type are forced to contend. The elevated position and the rolling to hilly character of the country where the Orangeburg fine sandy loam is most widely developed, coupled with the normally heavy rainfall which occurs during the earlier months of spring before vegetation is fully developed, make erosion a serious problem in its cultivation. It is desirable therefore that only the more moderate slopes within the area of this soil type should be occupied for the intertilled crops. Slopes of more than 10° declivity should be occupied by pasture grasses, while the steepest slopes should be allowed to remain in forest. Even over the more gentle slopes of the tilled fields it is desirable that contour farming and terracing should be adopted whereby the furrows are drawn around the circumference of the slope with only slight inclination from a level position.

Upon all of the steeper slopes frequent terraces should be left in sod, in order to intercept the flow of water across the surface. If this method of cultivation is carefully followed and deeper plowing practiced over the greater portion of the type, danger from erosion will be minimized, although under no conditions entirely obviated. Wherever possible some winter cover crop should occupy the surface soil after the picking of the cotton or the removal of the corn crop. If these precautions should be adopted generally in the tillage of the Orangeburg fine sandy loam, not only would the crop yields be profitably increased, but thousands of additional acres might be brought under cultivation.

Aside from the gullying of the steeper slopes through excessive erosion, there are practically no obstructions to the tillage of the Orangeburg fine sandy loam. Both soil and subsoil are stone free, and upon all of the more gentle slopes heavier teams and implements may be used, and should be used, for the preparation of the land and the tillage of the crop.

All of the more extensive areas of this soil occur within the warm temperate zone of the Gulf region. Rainfall is adequate and often excessive, and in many instances the tempering influence of the Gulf climate so modifies the growing season as to make possible the production of all of those crops suited to a warm temperate climate.

This favorable location of the Orangeburg fine sandy loam, coupled with its inherent individual characteristics, renders it one of the most valuable of the upland soils of the Gulf region.

IMPROVEMENT IN SOIL EFFICIENCY.

The greatest improvement in the agricultural efficiency of the Orangeburg fine sandy loam can probably be secured through proper attention to the prevention of erosion of its surface. In many areas where the soil has been mapped, particularly in the inland belts and at the higher elevations, the deforestation of considerable areas has accelerated erosion. The erosion has principally been marginal through the cutting back of the multitude of smaller streams on the steep slopes. This could be largely avoided by the construction of brush dams or other obstructions across the heads of gullies and around the margins of tilled fields to prevent the bodily washing away of the surface soil and subsoil.

The wasting of the land area of the type must be prevented. The reforestation of considerable areas of the steeper slopes and the prevention of additional gullying constitutes one of the most important needs of the Orangeburg fine sandy loam. Each individual farmer should take the utmost care that all of his tillage operations tend toward contour farming and the terracing of the fields to prevent destructive wash across the surface of even gentle slopes. Deeper plowing of the soil is imperative. The absorption of large amounts of rainwater falling within a brief period of time is impossible unless the surface soil is open and friable to a considerable depth. The producing capacity of the Orangeburg fine sandy loam is almost universally increased by deeper plowing, provided this be done gradually at the rate of about 1 inch each year. Usually this soil is not plowed over 3 inches deep on the majority of cotton farms within the area where it is found. This depth should gradually be increased until at each breaking the surface soil has been plowed to at least 8 or 9 inches. Upon fields where this deeper plowing is the common practice, and where other necessary precautions are taken, there is little trouble from erosion, and the crop yields are very decidedly increased.

The restoration of organic matter to the surface soil possesses a double value in increasing its crop-producing power. In the first place, it is essential in the constitution of a complete soil. In the second place, the fibrous nature of the material tends to bind the soil together, to absorb larger quantities of moisture, and to prevent erosion. One of the most economical methods for the incorporation of organic matter in the soils of the majority of cotton plantations of the South is the production of a leguminous winter cover crop, which prevents erosion through its matted surface vegetation during the

fall and winter rains and which may be turned under at a sufficiently early date in the spring to permit of the seasonable planting of either cotton or corn.

A wide variety of crops may be used for this purpose upon the Orangeburg fine sandy loam. In all of the more elevated regions crimson clover constitutes an excellent winter cover crop. It may be sown between the rows of corn at the last working and will make a good growth during the autumn months. In the milder climate near the coast this growth may be continued throughout the entire winter period. In all cases a heavy mat of vegetation is formed over the surface of the soil, and this may be grazed by the work stock without detriment either to the soil or to the crop. In the early spring the green manure may be turned under to restore organic matter to the surface soil.

Cowpeas make an excellent green manuring crop, which may be sown in midseason and harvested for hay, leaving the stubble and roots for incorporation in the soil or the crop may be sown at a later date, left upon the ground during the winter months, and turned under in preparation for spring planting. The velvet bean, soy bean, bur clover, and even lespedeza all have their value for such purposes in the different localities where they are easily grown.

In addition to these more valuable leguminous crops for green manuring purposes, winter oats may be grown almost universally upon the Orangeburg fine sandy loam, to be grazed off during the winter and early spring or to be turned under bodily for the restoration of organic matter. At the higher altitudes and in more northern locations winter rye may be similarly used, or even winter wheat. One or more of these crops should be grown upon every cotton plantation for the protection of the surface soil during the periods of winter rains and for the purpose of green manuring with the spring preparation of the land. The application of lime will promote the decomposition of the green manuring crop, and will assist in the preparation of the soil for the succeeding money crop of the summer season. The lime should be applied at the rate of 1,000 to 2,000 pounds per acre, depending upon the luxuriance of the growth which is turned under.

It is somewhat difficult to recommend any exact fertilizer practice for such a widely extended soil type, with such different conditions of climate, tillage, and crop production. It has been found through the experience of farmers and the work of agricultural experiment stations that the greatest increases in crop yields upon the Orangeburg fine sandy loam and upon similar soils are secured through the liberal use of those commercial fertilizers which contain high percentages of nitrogen and of phosphoric acid. A smaller percentage of potash is usually found adequate, and in some cases excellent crops have been

secured even when the potash was omitted from the fertilizer formula. This is not generally to be recommended, although the percentage of potash salts present may be somewhat small for this type. It has frequently been found to be excellent practice to use a home-mixed fertilizer consisting of one part acid phosphate and two parts cottonseed meal. This should be applied at the rate of 500 pounds per acre, with the addition of 100 pounds of kainit. A somewhat smaller application is sufficient for the corn crop, while one-half of this amount is enough for winter oats. The cottonseed meal supplies a considerable percentage of nitrogen in such a form that the slow decay of this organic manure maintains the supply against the percolation of excessive rainfall and thus favorably affects the crop growth through a longer period of time than is possible when the nitrogen is derived from other sources.

Wherever possible, all stable and yard manures should be saved and applied to the tilled land for use with the chemical fertilizers. The addition of organic matter in any form is one of the best means of increasing crop growth upon the Orangeburg fine sandy loam. Usually the applications of commercial fertilizer to the cotton crop upon this type are entirely too small to be effective. The addition of 200 to 250 pounds of the cheaper grades of fertilizer can scarcely be expected to produce any marked results either in the growth of the current crop or in the permanent increase of the producing capacity of the soil.

LIMITATIONS UPON SPECIAL CROPS.

The Orangeburg fine sandy loam is not so well adapted to the production of special crops as of the general farm crops. There are two chief exceptions to this rule. It is preeminently the best peach soil of the Gulf Coastal Plain region, owing to the inherent characteristics of the soil itself and to the elevated and well drained position which it normally occupies. The surface soil is easily tilled and kept in condition. The subsoil is sufficiently retentive of moisture to give good tree growth, and the elevation and slopes are such as to give good air and water drainage over considerable areas of the type. In consequence it has come to be the chosen soil for peach orcharding, not only in the long-established Georgia peach region, but also in the Alabama and Texas regions, where this industry is rapidly becoming established. The Elberta peach is the variety most commonly planted in the commercial orchards, but numerous others have been found successful under varying local conditions. The more elevated portions of the Orangeburg fine sandy loam which possess an undulating to gently rolling surface configuration and good air and water drainage are especially suited to peach production.

With the introduction of the cultivation of Cuban cigar filler tobacco it was found that the Orangeburg fine sandy loam and its associated type, the Orangeburg sandy loam, provided those soil conditions essential for the production of a large crop of tobacco with the necessary body and aroma to constitute a suitable cigar filler. In consequence, this special crop has been introduced upon this soil in southwestern Georgia, southern and central Alabama, and in eastern Texas. These two soils are preeminently the best adapted to the production of this grade of tobacco of any to be found within the Gulf region of the United States. Under suitable climatic conditions the extension of the production of the Cuban cigar-filler tobacco upon these two types is to be recommended.

EXTENT OF OCCUPATION.

The Orangeburg fine sandy loam has been extensively occupied for agricultural purposes. Upon all of the more level to rolling areas, particularly in the vicinity of the main routes of transportation, this soil is considered one of the best upland cotton soils and as such it is coming to be generally occupied for cotton and corn production. In a large number of the soil survey areas where this type has been encountered it is recorded as "chiefly cleared and esteemed as one of the best cotton soils." There still remain thousands of acres of the type, particularly in southern and central Alabama and in northeastern Texas, which have not been utilized for agricultural purposes and which may be occupied for the production of general and special crops as transportation facilities in these regions are improved. Wherever the surface topography is hilly or broken, and in certain areas where transportation facilities are inadequate, a considerable part of the type still remains in forest or is only partially occupied for pioneer farming.

CROP ADAPTATIONS.

The most important crop produced upon the Orangeburg fine sandy loam is upland cotton. Among the upland Coastal Plain soils the Orangeburg fine sandy loam, and its closely associated type, the Orangeburg sandy loam, constitute by far the best cotton soils of the timbered regions and are only equalled or excelled for the production of upland cotton by the soils of the Houston series, which are found in the black Cretaceous prairies of Alabama, Mississippi, and Texas. The soil is sufficiently rolling to possess excellent natural surface drainage without being so hilly as to offer any natural obstruction to the cultivation of large areas. The surface soil is mellow, friable, and easily maintained in good tilth. It is open and absorbs a large proportion of the rain which falls upon its surface. It is

sufficiently friable to prevent baking or clodding, and its internal drainage is adequate, so that tillage operations may be undertaken almost immediately after a season of rain. The presence of the sandy clay subsoil, and even of clay at greater depths, retards the percolation of moisture and holds an adequate supply within the subsoil during the entire period of growth of the cotton plant. The surface soil is sufficiently sandy to be warm and to force the plant to early growth without being so heavily charged with organic matter or so moist as to make growth of "weed" at the expense of fruiting. In consequence the Orangeburg fine sandy loam when properly handled constitutes one of the best cotton soils to be found in the Southern States.

In spite of the natural advantages afforded by this soil for cotton production, there is such a wide variation in the efficiency with which it is tilled and planted that there is a great range in the yields of cotton secured from the type. In almost all cases new land of this type when first planted to cotton yields in excess of one-half bale per acre and upon the best tilled farms, even after generations of cotton production, yields of one-half to 1 bale per acre are frequent. On the other hand, upon farms and plantations where little attention has been paid to the maintenance of organic matter in the surface soil, where plowing is shallow, and where the subsequent tillage of the crop is not properly conducted for the maintenance of an adequate moisture supply in the surface soil the yields sink as low as two-fifths bale per acre for a general average. The soil itself under almost all circumstances can produce in excess of one-half bale per acre. Any yield below this quantity merely marks inadequate management of the land. In the Gulf Coast region of southern Georgia, southern Alabama, and western Florida, cotton yields range from one-half to 1 bale per acre, and the type is esteemed as the best cotton land of the section with the possible exception of small areas of the Greenville fine sandy loam or the Tifton sandy loam.

In the interior belt of Alabama and Mississippi, where the Orangeburg fine sandy loam is widely developed, there is a considerably greater range in cotton yields, due to the fact that a larger proportion of the type is hilly and broken. Many slopes too steep for any cultivation are annually planted to this crop. As a result, the yields frequently sink below one-half bale to the acre and seldom average more than that amount. This is due in part to faulty methods of tillage and in part to an attempt to till areas which should be in pasture or in forest. In the Louisiana-Texas belt a smaller proportion of the total area of the Orangeburg fine sandy loam has been brought under cultivation than in the other two regions where it is prevalent. As a result, there are even wider variations in the yields secured, due to the causes already enumerated.

The type will be found to produce about 300 pounds of lint cotton per acre, which is easily exceeded by the best farmers and is rarely attained by those using less efficient methods.

For increasing the efficiency of the Orangeburg fine sandy loam as a cotton producing soil the following improvements must all be adopted in the treatment of this type:

(1) The restoration and maintenance of organic matter in the surface soil through the plowing under of leguminous green manuring crops, the use of cottonseed meal as an organic manure, or the production and application of larger quantities of stable and yard manures upon the cotton lands.

(2) Of almost equal importance is the gradual increase in the depth of plowing, so that instead of an average depth of 3 inches or less, the surface soil shall be plowed at least an inch deeper each year until the total depth of plowing reaches 6 inches, or more if practicable. The increase in depth of plowing is most essential upon the moderate slopes where some degree of erosion is experienced each year and is less necessary upon the level areas at the foot of slopes where soil eroded from higher-lying positions is accumulated. Upon the steepest slopes cultivation should be attempted only in conjunction with contour farming and the terracing of the land.

(3) The adoption of a systematic crop rotation is also a fundamental requisite for increasing the productiveness of this soil for cotton and other crops. At present there is too great a tendency to plant every available acre of the Orangeburg fine sandy loam to cotton each year. Cotton should be planted for one year upon a portion of the acreage, to be followed by a winter crop of oats for forage purposes, or of crimson clover for grazing, and later to serve as a green manure. The following season corn may be planted upon the same acreage, and cowpeas should be sown between the rows at the last cultivation. It is then possible to return, for the third season, to the beginning of the rotation and to plant cotton again, although it would be advisable in many instances to devote the third year in the rotation to the production of cowpeas, soy beans, or some other leguminous forage crop, to be used to sustain the work stock of the plantation. Where the necessary precautions of deep plowing, restoration of organic matter, liming, and inoculation are practiced, a fair to good stand of alfalfa may be secured upon this type, and in many instances could profitably be introduced into the rotation upon all farms and plantations of sufficient size to furnish an acreage large enough to justify a five or six year rotation.

(4) It is also essential that intertillage methods should be adopted for the cotton crop which will tend to the maintenance of moisture in the surface soil and the immediate subsoil. The most essential of these methods is the frequent stirring of the surface soil, not with

the small turn plow but rather with the spiked tooth cultivator and the sweep, so that weed growths may be prevented and the surface inch to inch and a half of soil may be kept thoroughly pulverized to form a dust mulch for the prevention of excessive evaporation. During the earlier period of growth of the cotton the older methods of cultivation are not particularly harmful and deep tillage in the center of the "middles" will not be detrimental, but after the cotton reaches a height of more than 1 foot, shallow cultivation, especially near to the rows, should be the only kind permitted. Otherwise the surface-feeding roots of the cotton plant will be destroyed and the power of the individual plant to secure moisture and nourishment from the soil materially lessened.

It is true that these methods of tillage apply to practically all sandy loam and fine sandy loam soils of the cotton-producing States, but their greatest efficiency in increasing the yields of cotton is most apparent upon such soil types as the Orangeburg fine sandy loam, the Orangeburg sandy loam, the Norfolk fine sandy loam, the Norfolk sandy loam, and other types with sandy surface soils.

The Orangeburg fine sandy loam is considered better adapted to the production of cotton than to the growing of corn, and the yields of the latter crop are relatively low as compared with the average yields for cotton. Nevertheless the Orangeburg fine sandy loam is a fair corn soil if the average yields of corn in the cotton-growing States are taken as a basis for comparison. The crop is seriously neglected upon practically all cotton plantations, and the ability of the Orangeburg fine sandy loam to produce corn under proper methods of tillage has rarely been tested. In the coast region along the eastern portion of the Gulf of Mexico yields range from 8 to 30 bushels upon the Orangeburg fine sandy loam, while maximum yields of 70 and 80 bushels per acre have been reported. This variation in yield in itself indicates differences in the efficiency of tillage rather than any deficiency in the soil itself.

The requisites for cotton production, as given above, apply with almost equal force to the growing of the corn crop. It should be possible, with proper preparation of the land and proper tillage of the crop, to maintain average yields of not less than 30 bushels per acre. Wherever possible, corn should be planted upon those portions of the type which possess the deeper surface soil, since corn in general requires a deeper zone for root growth than does cotton. Thus level or gently inclined areas of the Orangeburg fine sandy loam, lying at the foot of slopes, which have accumulated something of a wash from higher lying soils, which usually show an organic matter content in excess of the average of the type, and which possess a tendency toward subirrigation through the seeping of water from higher levels constitute the areas upon which corn will give its largest yields.

Since the higher lying areas are almost equally well suited for cotton production, a selection should be made of the areas to be planted to the two crops in accordance with the above directions.

In the inland belt of the eastern Gulf section, where the Orangeburg fine sandy loam is widely developed, the yields of corn range from 8 to 25 bushels, and about the same range is found in the Louisiana-Texas belt. The lower yields are chiefly caused by excessive erosion over some portions of the type, which unfits them for corn. Wherever the seasonal rainfall is light, approaching the critical amount for corn production, only the areas with deeper surface soil should be selected for this crop.

Oats constitute a very important crop for winter production upon the Orangeburg fine sandy loam. In the cotton States the crop is chiefly grown to be cut as hay for the feeding of work stock. It is therefore difficult to estimate the possible grain yields per acre. In many instances where the oats have been thrashed, yields have ranged from 15 to 30 or 35 bushels, and the latter yield could easily be secured with the adoption of a proper rotation and of that degree of carefulness of tillage requisite for the management of this soil.

Cowpeas are coming to be extensively grown, both for hay and as a green manuring crop. Wherever sown for hay the land is plowed broadcast and the cowpeas are drilled or broadcasted in. Excellent yields are reported, ranging from 2 to 4 tons per acre of cowpea hay. The land is benefited not only by the growing of a leguminous crop in proper rotation, but also through the plowing in of a large mass of organic matter, consisting of the stubble and roots of the plants. Upon plantations where cowpeas are annually grown for forage purposes unusually large amounts of stable and yard manure are commonly made. Thus the supply of organic matter for the fertilization of intertilled crops is doubly increased and the practice of producing a considerable area of cowpeas for hay is highly to be recommended upon all cotton plantations where the dominant soil is the Orangeburg fine sandy loam, or one of similar characteristics. Cowpeas are also sown between the rows of corn at the last cultivation and may be either grazed off or turned under in the succeeding spring as a green manuring crop.

Cotton, corn, winter oats, and cowpeas constitute the principal staple crops which are well suited for production upon the Orangeburg fine sandy loam wherever it is used for any system of general farming, including cotton as the main money crop. The growing of the other three in proper rotation will not only increase the cotton yields, but will also decrease or eliminate the heavy annual expenditures for grain and forage for the work stock and other farm animals and will ultimately reduce the heavy annual expenditures for fertilizer.

Special crops.—During the past decade a strong effort has been made to produce upon American soil a grade of cigar-filler tobacco which would equal or approach in quality the Cuban-grown tobaccos of a similar class. The greatest measure of success in this direction has been attained upon the Orangeburg fine sandy loam and the Orangeburg sandy loam in western Florida, southwestern Georgia, southern Alabama, and portions of eastern Texas. The crop is grown in the open field, without shade, and is best suited to the medium deep phase of the Orangeburg fine sandy loam or to a somewhat shallow phase of the Orangeburg sandy loam. Both soils are competent to produce heavy yields per acre under proper methods of tillage and fertilization, and both produce tobacco having the body, texture, and aroma necessary for a good cigar filler. It is not possible to attain success in the production of filler tobacco, even upon these types of soil, unless the utmost attention is paid to the deep and thorough preparation of the land, to the maintenance of a large supply of organic matter in the surface soil, to the heavy fertilization of the crop by the use of 500 pounds or more of special commercial fertilizer, and by the thorough tillage and tending of the crop during every stage of its growth. Tobacco is an exacting crop in regard to land preparation and the labor which must be bestowed upon it during its growth, curing, and preparation for the market. The yields secured upon the Orangeburg fine sandy loam range from 500 to 1,200 pounds or more per acre, and it may be characterized as the most valuable soil of the Southern States for the production of the Cuban type of filler tobacco. In all three of the different regions in which the Orangeburg fine sandy loam is characteristically developed successful attempts at the production of this crop have been made.

In a number of scattered localities alfalfa has been successfully grown upon the Orangeburg fine sandy loam. The type lacks one of the fundamental essentials for the easy and natural production of alfalfa. It is not particularly calcareous either in soil or subsoil, and in consequence land which is to be devoted to alfalfa production must be heavily limed. This is best accomplished through the application of not less than 2,000 pounds per acre of burned stone lime, slaked in the field, spread evenly over the surface, and harrowed in to a depth of 2 or 3 inches at least two weeks before the crop is to be seeded. Careful attention to artificial inoculation of the soil is essential. This may be accomplished through the application of the commercial cultures or by broadcasting from 500 to 1,000 pounds of inoculated surface soil from an established alfalfa field. These are the two chief precautions which must be taken for seeding to this special crop. The soil which is selected for alfalfa growing should be sufficiently productive to be able to grow more than one-half bale of cotton to the acre or in excess of 30 bushels of corn. Otherwise

the production of alfalfa should not be attempted at once, and a year or more should be devoted to building up the land, chiefly through the incorporation of organic matter and the increase in the depth of the surface soil. It is also essential that the area to be devoted to alfalfa growing should be thoroughly summer fallowed and cultivated at frequent intervals for the destruction of weeds before seeding is attempted. Where these precautions are taken, alfalfa growing has proved successful on the Orangeburg fine sandy loam and there are many scattered fields of small area located upon the type which are cutting 3 tons or more of hay per acre each year. With the present high price of alfalfa and other hay in practically all of the cotton-growing States, yields of this magnitude compete with cotton in acreage profit, while the labor required to tend and harvest the crop is far less in the case of the alfalfa, as the greater proportion of it can be performed by machinery.

Vegetable and fruit crops.—The Orangeburg fine sandy loam is not a type suited to market gardening or trucking. It is sufficiently valuable to warrant the more extensive growing of a few selected vegetables, especially sweet potatoes, either for home use or for shipment to the northern markets. Yields of 75 to 250 bushels per acre are commonly reported, and with proper attention to the preparation and fertilization of the land an average yield in excess of 150 bushels per acre may be readily secured.

Irish potatoes, for local consumption or for shipment during midseason to the northern markets, are also profitably grown on the Orangeburg fine sandy loam. The yields are about the same as for sweet potatoes or a little less. With greater attention to the preparation of the land, the incorporation of organic matter in the surface soil, and the heavy fertilization of the crop, coupled with proper tillage and, in some instances, with the spraying of the vines to combat insect pests and fungous disease, this soil would prove admirably adapted to potato growing.

Among the special crops for market-gardening or trucking purposes, tomatoes probably constitute the crop best suited to the Orangeburg fine sandy loam. Considerable areas of the type in central Mississippi and in northeastern Texas are already devoted to the production of this crop, with excellent results, and large additional areas with proper transportation facilities might well be occupied for tomato growing. Wherever possible the portion of the crop not shipped in baskets to the northern markets should be canned at local establishments. The yield per acre ranges from 100 to 150 bushels under normal conditions, or to double that yield where conditions are exceptionally favorable. Watermelons and cantaloupes are grown locally and produce fair yields of good quality. It is probable that the more sandy soils, such as the Norfolk fine sand, the Norfolk sand,

and the Orangeburg sand and fine sand, are better suited to the production of melons as a trucking crop.

The Orangeburg fine sandy loam constitutes one of the best of the Coastal Plain soils for the production of peaches. The most successful areas devoted to peach orcharding in central Georgia are dominated by this type. Commercial orchards have also been planted in Alabama, Mississippi, and Texas; and in all instances where proper attention has been paid to the selection of sites which, through their elevated and rolling nature, possess good air and water drainage, the orchards have been successful. The trees make good healthy growth, come into bearing at an early date, and produce peaches of exceptionally fine flavor and color. The Elberta variety is favored for the principal plantings, but several others are also grown in different localities. It is probable that no other Coastal Plain soil type can compete with the Orangeburg fine sandy loam for the production of this fruit.

It is evident from a consideration of the Orangeburg fine sandy loam, either as a general farming soil or as a vegetable and fruit producing soil, that the type is exceptionally valuable in all areas where it occurs with undulating to rolling surface topography. In the hilly and broken regions its use for agricultural purposes is not yet required, and such areas should remain in forest, or where cut over should be reforested.

Both the longleaf and loblolly pine are indigenous to the type, and the latter tree readily reseeds upon all deforested areas which are not at once overgrown to scrubby hardwoods and are reasonably well protected from accidental fires. The time has arrived when the timber crop must be considered as an essential part of the revenue-producing resources of many Southern farms. It should be possible for the majority of farms and plantations located in the more rolling sections occupied by the Orangeburg fine sandy loam and its associated types to foster a growth of these valuable species of timber trees and, through properly directed management of wood-lot and forest areas, to increase the revenues derived from annual crops by the sale of selected timber.

FARM EQUIPMENT.

Farm equipment ranges from the light-weight one-mule hitch to the three or four mule hitch used for hauling the heavy disk plows and disk harrows. With a better understanding of the capabilities of this soil and with increased prosperity of the farmers, leading to the introduction of more adequate and modern farm machinery, there will undoubtedly be rapid improvement in the farm equipment over areas occupied by the Orangeburg fine sandy loam.

For the proper tillage of this type upon any large scale, medium to heavy weight work stock should be employed, and the greatest

economy in the preparation of the land and its subsequent tillage, together with increased crop yields, will be secured by the deep-cutting disk plow and disk harrows which plow the land broadcast and throw the loose surface material into a mellow, even mass. By the use of such machinery the land is more quickly prepared and cotton in particular may be planted seasonably upon a larger acreage. The trash of the preceding summer's growth is thoroughly chopped down and incorporated in the surface soil to add needed organic matter, and through the use of disk cultivators a shallow dust mulch is easily maintained during the latter part of the growing season. There is a rapidly increasing tendency toward the use of such tools and equipment in the tillage of the Orangeburg fine sandy loam, and the average crop yields of the type will be increased with the extension of their introduction.

SUMMARY.

The Orangeburg fine sandy loam is one of the most extensively developed of the Coastal Plain soils. It is found chiefly in the Gulf Coast region, although scattered areas exist in the Middle Atlantic States. It occurs in three extensive belts—the first extending from southwestern Georgia and northern Florida westward through southern Alabama near to the Gulf coast, the second extending from west-central Georgia through central Alabama into eastern and northeastern Mississippi, and the third covering the greater portion of northern Louisiana, southwestern Arkansas, and northeastern Texas and extending across the Red River into southern Oklahoma.

It lies at altitudes ranging from 80 to 250 feet in the eastern Gulf region and from 150 to 500 feet in the Louisiana-Texas region. The surface features of the type are either gently undulating to rolling or steeply sloping and hilly in the higher lying portions of the type near its inland margin. Drainage is generally excellent.

Erosion is the greatest menace, and all of the steeper slopes should be carefully tended to prevent an almost imperceptible wash of the finer grained material to lower levels.

The Orangeburg fine sandy loam lies within the belt of the warm temperate Gulf region of abundant to even excessive rainfall, although the western extension of the type lies within a region of moderate to light precipitation. Throughout the entire extent of its development the Orangeburg fine sandy loam is favored with a long growing season.

The Orangeburg fine sandy loam is particularly adapted to upland cotton, being equaled in efficiency only by the Black Prairie soils. Yields of two-fifths of a bale to one bale per acre are secured, and the general average for the type is in the vicinity of one-half bale per acre. The average production of the type may be considerably increased by the general adoption of proper methods of the preparation

and tillage of the land, regular crop rotations, and by increasing the organic-matter content of the surface soil.

While not so well adapted to corn production as to cotton growing, the type is a fair average corn soil when its yields are compared with those of other types in the upland portions of the Southern States. To increase the corn yields requires about the same methods as are used for increasing the production of cotton.

Winter oats are commonly grown as a forage crop, producing good yields. In a few instances the grain is thrashed, giving about 25 bushels of oats per acre. The crop should be grown in regular rotation with cotton and corn.

Cowpeas are coming to be more extensively grown as a principal hay crop upon the Orangeburg fine sandy loam. Excellent yields of hay are secured, and the acreage of this crop should be widely extended.

The Orangeburg fine sandy loam and its associated type, the Orangeburg sandy loam, are the best soils for the growing of the Cuban cigar-filler tobacco. Yields of 500 to 1,200 pounds per acre are obtained upon properly prepared and fertilized land in all of the regions where the type is characteristically developed.

It is the best Coastal Plain soil type for the production of peaches, particularly the Elberta. Elevated areas with good air and water drainage must be selected. Increasing acreages are being planted.

Among vegetable and truck crops, sweet potatoes, Irish potatoes, tomatoes, watermelons, and cantaloupes are quite extensively grown and are the best truck crops for this type.

There is a wide variation in the adequacy of farm equipment upon the type, ranging from the most primitive in pioneer communities to the most modern improvements on well-regulated plantations. The use of heavier work stock, and particularly the introduction of disk plows, harrows, and cultivators for the broadcast preparation and tillage of the land are to be recommended.

The reforestation of denuded hills and the steeper slopes should be carefully undertaken, since the soil is well suited to the growing of its native trees, the longleaf and loblolly pine.

Wherever transportation is adequate the greater portion of the total area of the Orangeburg fine sandy loam is occupied for some form of crop production. In more remote localities, particularly in the west Gulf region, thousands of acres of the type still remain in forest or in scrub timber and constitute cheap areas of highly efficient cotton soil, which still await development.

Approved.

JAMES WILSON,
Secretary of Agriculture.

WASHINGTON, D. C., *August 30, 1911.*

APPENDIX.

The following table shows the extent of the Orangeburg fine sandy loam in the areas surveyed to this time.

In the first column is stated the particular survey in which the soil was encountered; in the second column, its extent of development in acres; and in the third column, the volume of the Field Operations of the Bureau of Soils in which the report upon the area may be found. Those desiring a detailed description of the soil and of the general conditions which surround it in any particular area may consult these volumes in almost any public library.

Areas of the Orangeburg fine sandy loam encountered in the soil survey.

Survey.	Area of soil.	Year of publication, Field Operations.	Survey.	Area of soil.	Year of publication, Field Operations.
Alabama:	*Acres.*		Mississippi:	*Acres.*	
Autauga County	51,328	1908	Biloxi area	3,008	1904
Baldwin County	22,784	1909	Clay County	4,352	1909
Bibb County	74,496	1908	Crystal Springs area	17,280	1905
Butler County	89,856	1907	Holmes County	4,800	1908
Dallas County	159,040	1905	Jasper County	85,184	1907
Hale County	86,592	1909	Monroe County	92,992	1908
Mobile area	26,880	1903	Montgomery County	46,144	1906
Montgomery County	6,208	1905	Oktibbeha County	14,784	1907
Perry County[1]	196,288	1902	Scranton area	3,072	1909
Sumter County	107,264	1904	North Carolina:		
Arkansas:			Duplin County	7,616	1905
Miller County	224,640	1903	Robeson County	1,536	1908
Florida:			Oklahoma:		
Gadsden County[1]	37,248	1903	Tishomingo area	53,888	1906
Jefferson County	29,568	1907	South Carolina:		
Leon County	73,920	1905	Conway area	3,072	1909
Marianna area	25,728	1909	Texas:		
Georgia:			Anderson County	102,080	1904
Bainbridge area	36,480	1904	Bastrop County	17,216	1907
Fort Valley area[1]	24,896	1903	Henderson area	42,688	1906
Grady County	32,256	1908	Houston County	57,088	1905
Thomas County	53,760	1908	Jacksonville area	18,752	1903
Louisiana:			Lee County	57,920	1905
Bienville Parish	12,288	1908	Lufkin area	6,400	1903
Caddo Parish	30,144	1906	Nacogdoches area	16,320	1903
DeSoto Parish	6,976	1904	Paris area	69,184	1903
Lincoln Parish	3,968	1909	Robertson County	29,888	1907
Ouachita area	172,800	1903	Wilson County	77,056	1907
Tangipahoa Parish	84,672	1905			
Winn Parish	5,440	1907			

[1] Mapped as Orangeburg sandy loam.

UNI[illegible] LIBRARY

RETURN TO the circulation desk of any
University of California Library
or to the
NORTHERN REGIONAL LIBRARY FACILITY
Bldg. 400, Richmond Field Station
University of California
Richmond, CA 94804-4698

ALL BOOKS MAY BE RECALLED AFTER 7 DAYS
2-month loans may be renewed by calling
(510) 642-6753
1-year loans may be recharged by bringing books to NRLF
Renewals and recharges may be made 4 days prior to due date

DUE AS STAMPED BELOW

MAR 21 1995

20,000 (4/94)

YC 67891